

REMARKS

Status of the Claims

Claims 1, 4, 7, 11, 12, 15-23 and 25 are now present in this application. Claims 1 and 25 are independent. Claims 15-22 have been withdrawn. Claims 1 and 25 have been amended to further clarify the subject matter therein as supported by the present application. No new matter has been added.

Reconsideration of this application is respectfully requested.

Examiner Interview

Applicants wish to thank the Examiners for the courtesies extended to Applicants' representative during the personal interview which was conducted on March 15, 2012. An Examiner Interview Summary was made of record as Paper No. 20120315. During the interview, Applicants' representative explained the problems of the conventional apparatus and method, distinguishable solution and its effects of the present invention for the Examiners. Also, proposed changes to the claims were discussed in an attempt to place the claims to overcome the prior art rejections of record. The claims have been updated in the manner discussed during the interview. Accordingly, reconsideration and allowance of the present application are respectfully requested.

Rejection under 35 U.S.C. § 103(a)

Claims 1, 4, 7, 11, 12, 23 and 25 are rejected 35 U.S.C. 103(a) as being unpatentable over US Patent No. 6,331,384 to Satoi (hereinafter '**384**'), in view of US Patent No. 6,176,667 to Fairbairn et al. (hereinafter '**667**'). This rejection is respectfully traversed.

The Embodied Invention

Claim 1 of the present application is directed to a device usable for forming an alignment layer of a display apparatus, the device comprising: a printing part including a print table fixing a substrate, and at least one inkjet head to spray an alignment material onto an entire surface of the substrate including all pixel regions to form the alignment layer printed on the entire surface

of the substrate; a drying part positioned directly and vertically above the printing part, the drying part including a dry table having a hot plate adapted to dry a solvent of the alignment material onto the substrate; and a transferring part having a transfer robot lifting the printed substrate to a height higher than the inkjet head in a vertical direction, for transferring the printed substrate from the printing part to the drying part and placing the printed substrate on the dry table after the printing process, wherein the at least one inkjet head is positioned between the print table and the drying part and is moved over the substrate in a horizontal direction when the print table having the substrate thereon is maintained at a fixed state, and wherein at least an array of the inkjet heads is arranged in at least one line according to a long side or a short side of the substrate.

Claim 25 also has the features similar to claim 1 in a varying scope.

The Problems to be Solved

Prior to the present invention, the alignment layer was formed by using a plurality of rolls such as doctor roll, anilox roll, and printing roll and rubber plate. Specifically, as illustrated in Fig. 1 of the present application, a substrate 10 for printing an alignment layer thereon is fixed to a predetermined fixing device 12. Then, an alignment material is sprayed onto the anilox roll 13. When operating the device for printing the alignment layer having the plurality of rolls, the doctor roll 11 is operated to engage with the anilox roll 13, so that the alignment material sprayed onto the anilox roll 13 is deposited on the minute grooves 13a of the anilox roll 13. Subsequently, the alignment material deposited on the anilox roll 13 is printed on the rubber plate 17 of the printing roll 15 as the anilox roll 13 and the printing roll 15 rotate as engaged with each other. As the printing roll 15 rolls, the alignment material printed on the rubber plate 17 is transferred and printed on the substrate 10 according to the emboss pattern of the rubber plate 17, thereby forming the alignment layer 21 on the substrate 10 (ST1). After that, the alignment layer 21 on the substrate 10 is hardened at a predetermined temperature (ST2), and then the rubbing process is performed on the hardened alignment layer 21 with a rubbing roll 23 (ST3). According to the aforementioned method, the alignment layer is formed on the substrate 10.

However, such method has many problems as follows:

- a. It is necessary to adhere the rubber plate to the printing roll and to clean the respective rolls. Unclean rolls lead the alignment layer to have spots or pinholes.
- b. Anilox roll having the minute grooves and doctor roll have worn out according to the anilox roll operating with the doctor roll. As a result, work efficiency is lowered.
- c. Process forming the alignment layer is complicated and it is hard to obtain the unification of the printing part and the drying part. It is hard to obtain the unification of the printing part and the drying part since height of rollers is about 3 m. In this regard, see Fig. 3 and its relevant description [0015] of the present specification.
- d. Due to the large-sized glass substrate appearance, printing rolls should also become larger, generating inconvenience.

Distinctions Over the Cited Art

(1) The claimed invention is directed to a device for forming an alignment layer of a display apparatus.

On the other hand, '384 relates to a color filter of a display apparatus. Thus, the claimed device cannot be equated with the color filter of '384 in terms of structural elements and its relationship.

With regard to this point, the Examiner asserts at page 4 of the Office Action that an inkjet printer prints whatever liquid is charged into reservoirs. The printer of '384 is clearly capable of receiving and printing an alignment fluid containing liquid.

However, it is respectfully submitted that the present invention newly applies the inkjet printing system to the formation of the alignment layer. As explained above, the conventional process using plural rolls reveals lots of problems. Adopting the inkjet printing process for the formation of the alignment layer means that the traditional roll system should not be used any longer. Thus, the inkjet printing system for the present alignment layer is not mere an adoption from the color filter using the inkjet printing system. Therefore, the inventiveness of the claimed invention should be reconsidered.

(2) The claimed print table having the substrate thereon is maintained at a fixed status so that when one of the inkjet head is moved over the substrate in horizontal direction, the print part having the substrate thereon is maintained at a fixed state. That is, in the claimed invention, the substrate and the printing table are not moved.

On the other hand, the substrate of ‘384 is moved to the position of the inkjet head so that the inkjet head 55 is driven in conformity with the positions of the color filter to discharge ink toward the substrate. See col. 12, lines 36-50 of ‘384.

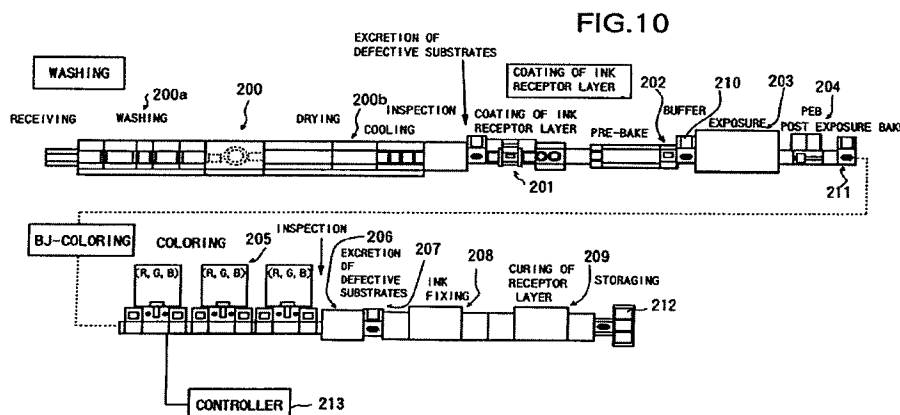
The glass substrate 1 thus treated so that the portions at the black matrix 2 are rendered hydrophobic is conveyed to the coloring unit 205. As at the exposure apparatus 203, the coloring unit 205 effects precise positioning with respect to the reference positioning mark. In order for positioning to be carried out, the stage holding the glass substrate 1 is moved accurately in a horizontal plane by a mechanism similar to that used in the exposure apparatus 203. The glass substrate 1 is conveyed to the positioning stage by a conveyance system (described later in greater detail) so that its position may be adjusted. At the completion of positioning, the substrate is moved, along with the stage, to the position of the inkjet head 55 and the inkjet head 55 is driven in conformity with the positions of the pixels of the color filter to discharge ink toward the glass substrate 1.

As stated above, in the present invention, the substrate and the print table are not moved. Rather, the inkjet head is moved in a horizontal direction. Thus, the claimed distinction should be reconsidered. Nevertheless, to further clarify the distinctions between the present invention and ‘384, Applicants have amended the claims to recite “wherein the at least one inkjet head is positioned between the print table and the drying part and is moved over the substrate in a horizontal direction when the print table having the substrate thereon is maintained at a fixed state.” (emphasis added).

During the interview, Applicants representative explained this distinction. The Examiners both agreed that this limitation is distinct over ‘384 as indicated in the Interview Summary.

(3) The claimed transferring part has a transfer robot lifting the printed substrate to a height higher than the inkjet head in a vertical direction, for transferring the printed substrate from the printing part to the drying part and placing the printed substrate on the dry table invention after printing process.

On the other hand, '384 discloses every component of apparatus for manufacturing a color filter are positioned side by side in a horizontal line, as shown in FIG. 10 below:



Under such an in-line structure, it is not necessary for the apparatus of '384 to lift a glass substrate 1 in a vertical direction, for transferring from a coating apparatus 201 to a heating apparatus 202 or from the coloring unit 205 to the drying apparatus 208.

With regard to this point, the Examiner states at page 6 d) of the Office Action that

Col. 14, lines 60-col. 15, line 27 of '384 details a robot capable of motion in the vertical and radial direction of cylindrical; choosing a robot for this transfer would be one of a finite number of choices that a person skilled in the art would be able to choose between with a reasonable expectation of success (col. 14, lines 36-49 discussing conveyors and robots) for transferring the substrate from the printing part to the drying part (col. 18, lines 38-45 teaches that the units can be individual modules with substrates transferred individually; it would be a matter of design choice to control the order in which substrates are transferred between modules), and placing the printed substrate on the dry table after the printing process (as above).

Applicants respectfully disagree. Actually, col. 18, lines 38-45 of '384 states as follows:

"By way of example, the foregoing description relates to an in-line arrangement constructed by connecting the apparatus of each manufacturing step. However, the system may be constructed of individual apparatus and the glass substrates may be conveyed by individual cassettes. Further, part of the system may be connected in an in-line arrangement and part may be constituted by individual apparatus."

From the above disclosure, '384 simply states that the system can be constructed by individual apparatus and cassettes. However, '384 fails to disclose or suggest that such individual apparatus and cassettes mean a transfer robot lifting the printed substrate to a height

higher than the inkjet head in a vertical direction. From such description of '384, it cannot be said that the claimed transferring part having a transfer robot is read on '384. This, it is not reasonable that the claimed transferring part is a matter of design choice as asserted by the Examiner. Reconsideration is respectfully requested.

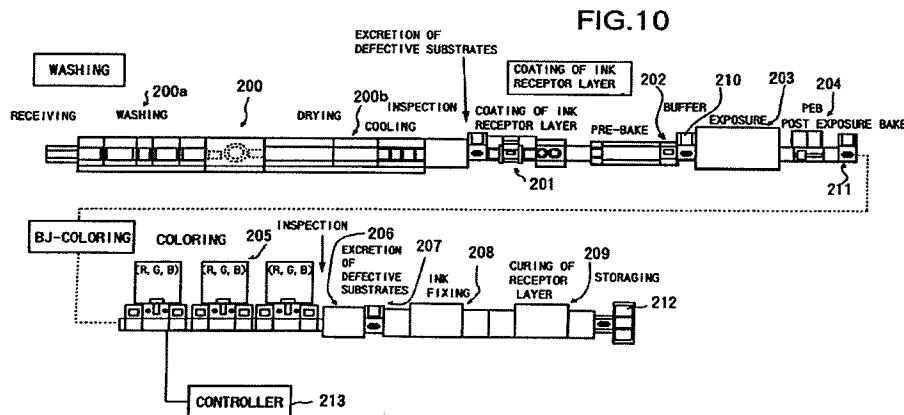
Further, the robot 303a or the hand 303a' of the robot 303a of '384, does neither transfer the glass substrate 1 from coating apparatus 201 to the heating apparatus 202 nor from the coloring unit 205 to the drying apparatus 208, in a vertical direction. In this context, see the following disclosure. Also, see FIG. 14 of '384.

" ... the robot 303a extracts the colored glass substrate from the coloring apparatus 90a and places it on the discharge conveyor 305a. When the robot 303a places the glass substrate 1 on the discharge conveyor 305a, the pins are raised and wait in standby. The spacing between the lifting pins 308a in the direction in which the robot penetrates is set to be greater than the width of a hand 303a' of the robot 303a. Upon receiving the colored glass substrate 1 from the coloring apparatus 90a, the robot 303a is withdrawn along its linear axis(R axis) in a horizontal plane and then the hand 303a' is swiveled clockwise amount the vertical axis (Z axis). ...", as described at col. 14, line 60 – col. 15, line 8 of '384.

That is to say, the robot 303a of '384 transfers the glass substrate 1 from the color apparatus 90a to the discharge conveyor 305a as opposed to transferring the glass substrate 1 from coating apparatus 201 to the heating apparatus 202 or from the coloring unit 205 to the drying apparatus 208. The robot 303a of '384 is able to move in a horizontal direction such as R axis, and the hand 303a' of the robot 303a is able to spin clockwise amount the vertical direction such as Z axis, as opposed to moving in the vertical direction. Therefore, the robot 303a or the hand 303a' of the robot 303a of '384 does not correspond to the transferring part of the claimed invention. Reconsideration is respectfully requested.

(4) The deficiencies of '384 cannot be cured by the secondary reference of '667 since '667 also fails to disclose or suggest the claimed features.

Also, it is impossible for '384 and '667 to be combined with each other due to a conflicting operational mechanism. As explained above, '384 discloses every component of apparatus for manufacturing a color filter are positioned side-by-side in a horizontal line, as shown in FIG. 10 below:



Thus, apparatus of '384 requires a drying part and the printing part to be in-line arrangement.

On the other hand, as indicated in the Office Action at page 7 h), apparatus of '667 teaches a pair of enclosed modules aligned directly over/under each other (FIG 1, items A1 and A2; Col. 3, lines 11-19). Applicants respectfully submit that if the above essential in-line arrangement of '384 are altered by a vertical arrangement of drying part of '667, the intended coloring filter of '384 would not be formed. In other words, the essential elements with the in-line arrangement would not be modified in such a way that the intended purpose and/or principle of operation of '384 become impossible. Thus, combining '384 with '667 would destroy the respective teachings of '384 and '667. When the combination of the cited art would destroy or change the principle of operation of the cited art invention, *prima facie* obviousness is not established. Case laws also support as follows:

According to case law, a prior art reference must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention. W.L. Gore & Associates, Inc. v. Garlock, Inc., 721 F.2d 1540 (Fed. Cir. 1983), cert. denied, 469 U.S. 851 (1984). (cited in MPEP 2141.02). Where the Examiner's proposed modification would render the prior art version unsatisfactory for its intended purpose, the proposed combination is improper. In re Gordon, 733 F.2d 980, 902, 221 USPQ 1125, 1127 (Fed. Cir. 1984); see also Ex parte Rosenfeld, 130 USPQ 113 (POBA 1961). If the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious," In re Ratti, USPQ 349 (CCPA 1959).

Accordingly, for at least the reasons (1)-(4) set forth above, it is apparent that the claimed invention is structurally distinct from the cited art. Reconsideration and withdrawal of the prior art rejections are respectfully requested.

Conclusion

All of the stated grounds of rejection have been properly traversed, accommodated, or rendered moot. Applicants therefore respectfully request that the Examiner reconsider all presently outstanding rejections and that it be withdrawn. It is believed that a full and complete response has been made to the outstanding Office Action, and as such, the present application is in condition for allowance.

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Kay Kyung-sook Chang, Registration No. 56,946, at the telephone number of the undersigned below to conduct an interview in an effort to expedite prosecution in connection with the present application.

If necessary, the Director is hereby authorized in this, concurrent, and future replies to charge any fees required during the pendency of the above-identified application or credit any overpayment to Deposit Account No. 02-2448.

Dated: APR 17 2012

Respectfully submitted,

By 

Esther H. Chong

Registration No.: 40,953

BIRCH, STEWART, KOLASCH & BIRCH, LLP

8110 Gatehouse Road, Suite 100 East

P.O. Box 747

Falls Church, VA 22040-0747

703-205-8000